Maritime Spatial Planning Forum

Global Meets Regional

Pan Baltic Scope approach to Green Infrastructure mapping

Anda Ruskule & Didzis Ustups, MoEPRD

Lena Bergström, Jan Schmidtbauer Crona, Jonne Kotta, Philipp Arndt, Solvita Strāķe, Sandra Sprukta, Ingūna Urtāne

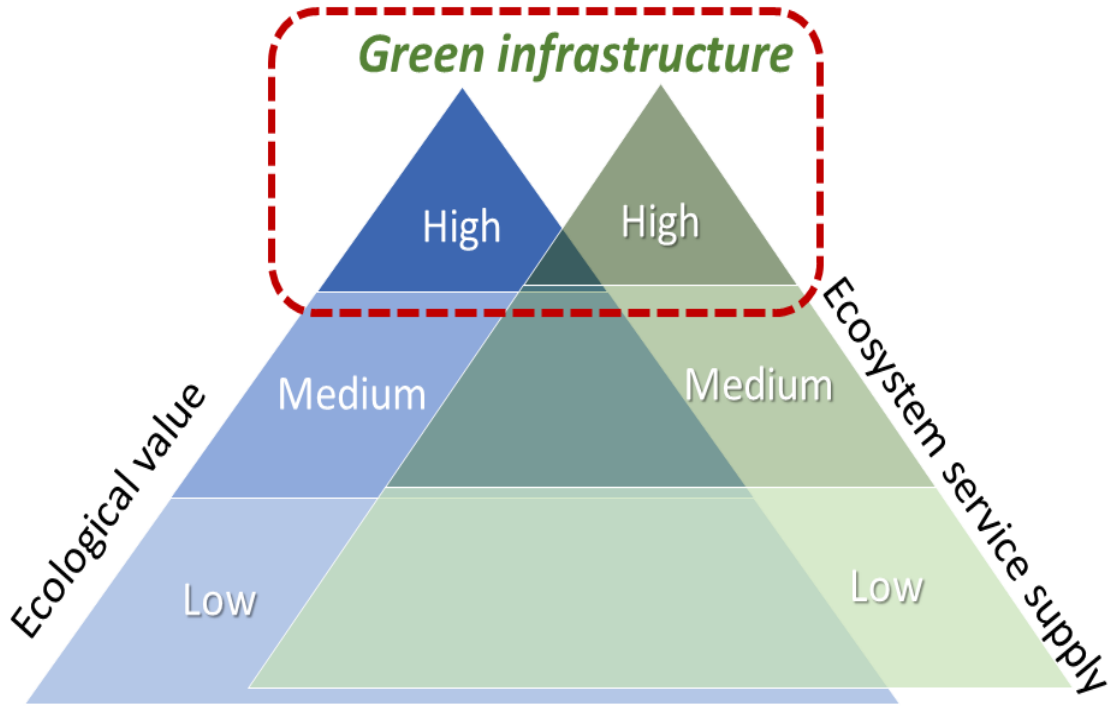
20 November, 2019, Riga

Co-funded by the European Maritime and Fisheries Fund of the European Union

Pan Baltic Scope definition of marine GI

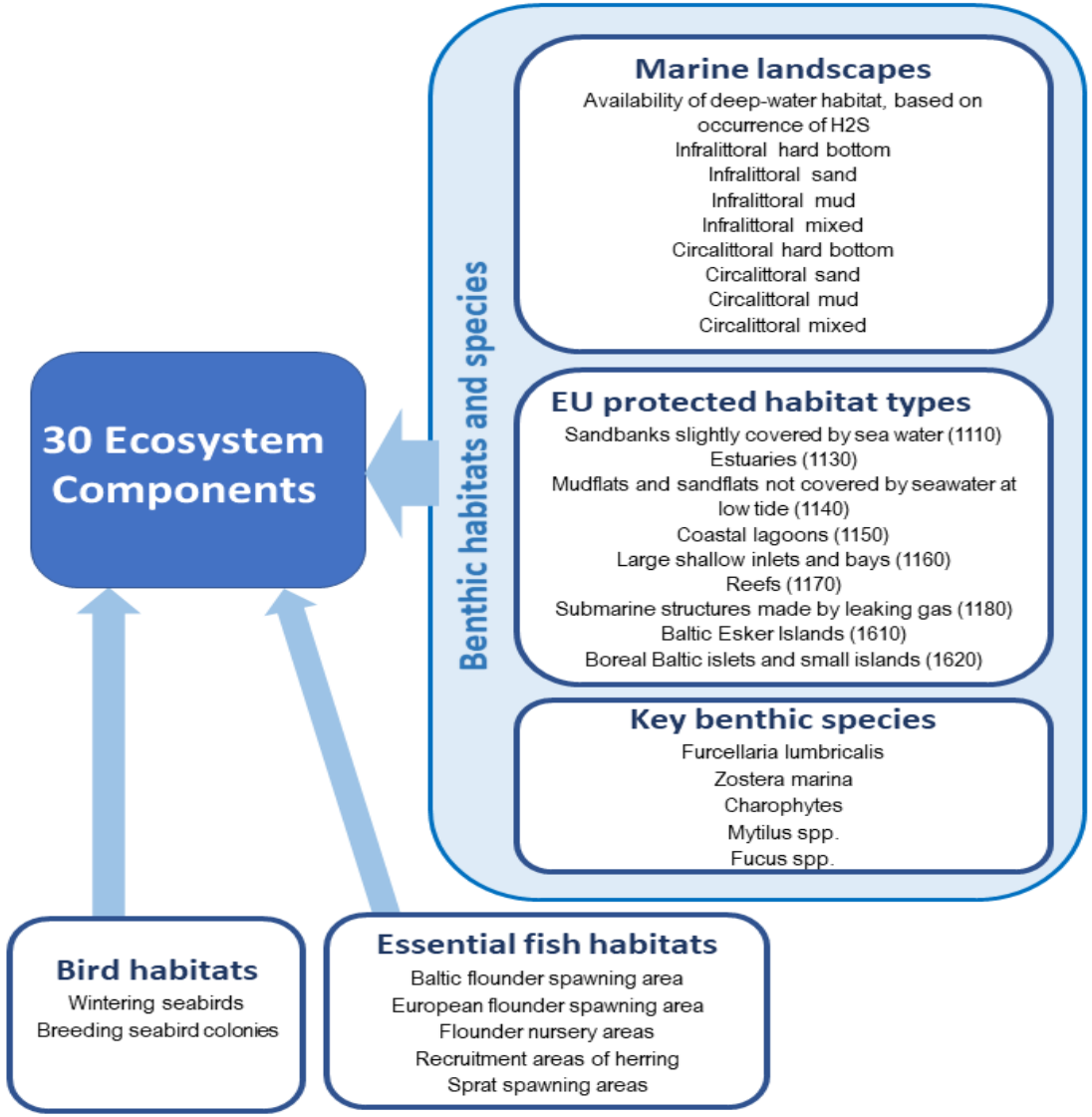
- **Obcective of the «Green Infrastructure» activity**
  - To outline a concept of marine “green infrastructure”
  - To test the concept by utilizing available data

- **Pan Baltic Scope definitions**: Marine GI is formed by a spatial network of ecologically valuable areas significant for:
  - ecosystems’ health and resilience,
  - biodiversity conservation and,
  - multiple delivery of ES essential for human well-being.



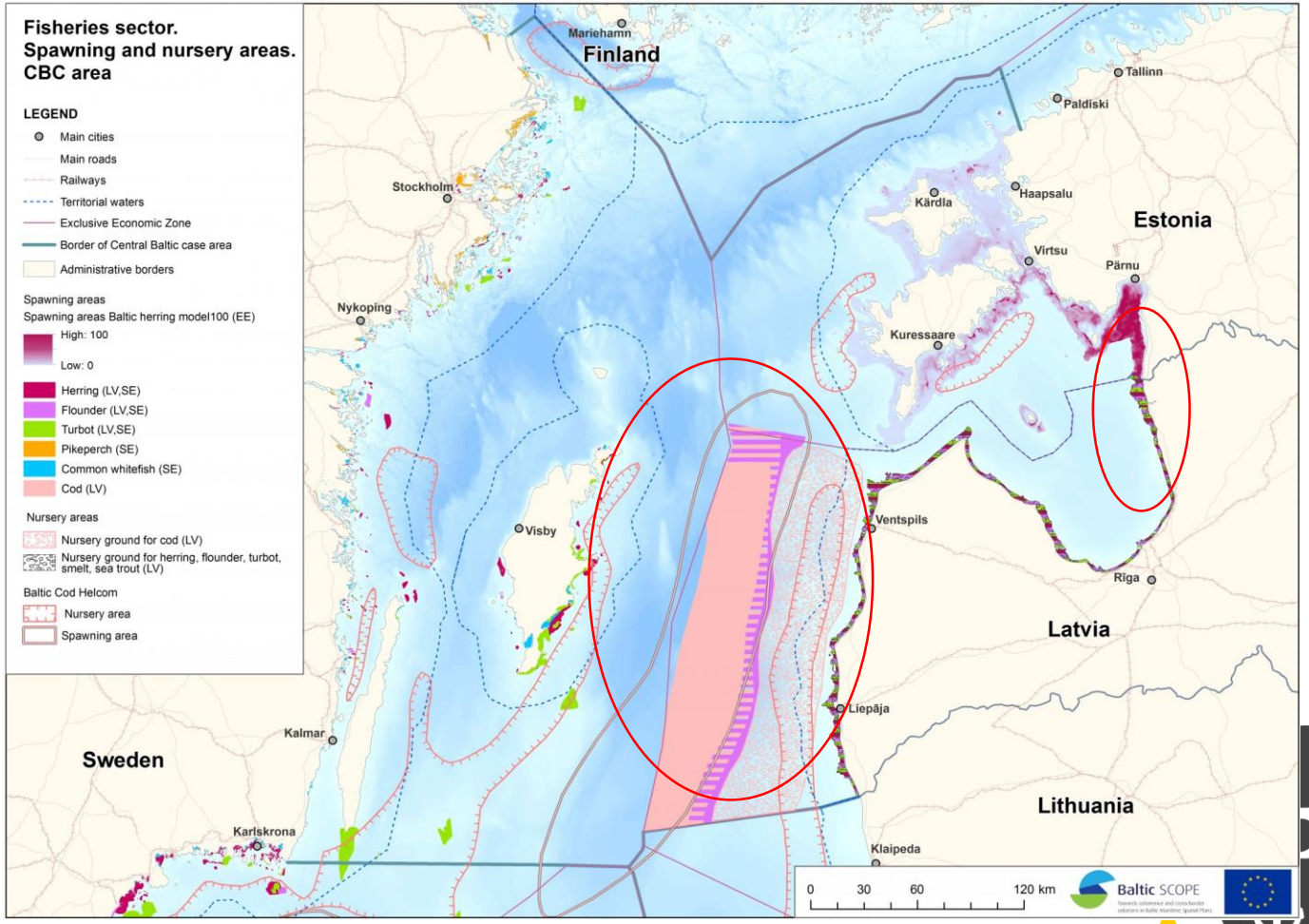
Step1: Identification of the components forming marine GI

Mapping based on available data sets:
HELCOM Maps and Data services, prepared in the HELCOM HOLAS II project



Step 2: Mapping essential fish habitats

- Starting point:
- BalticScope results
- Common stocks- different mapping approaches
- Outdated or/and regional maps



Balticscope recomendations:

Jointly identify essential fish habitat, including spawning, nursery and growth areas, for the whole Baltic Sea for species of interest to fisheries

Jointly for the whole Baltic Sea

Baltic Marine Environment Protection Commission

Regional expert workshop on essential fish habitats,
organized by Pan Baltic Scope project and HELCOM
Riga, Latvia, 12-13 December 2018

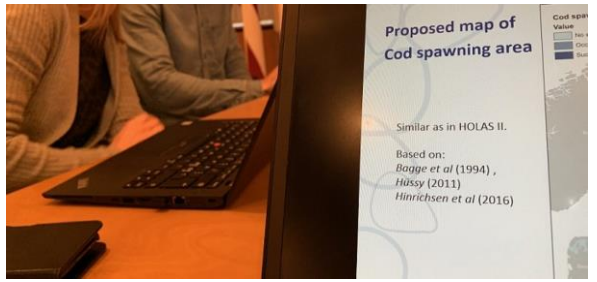
Pan Baltic Scope

Co-funded by the European Maritime and Fisheries Fund of the European Union

Essential Fish Habitats (and Marine Spatial Planning)

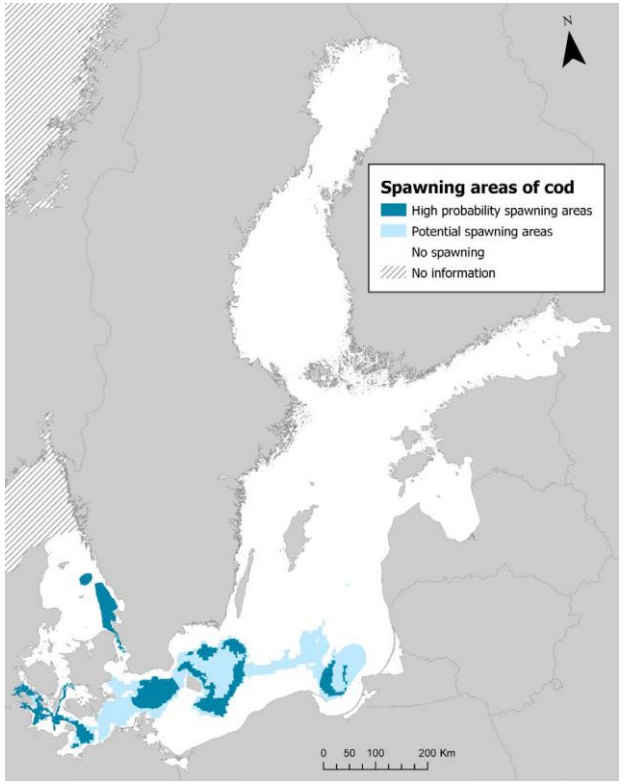
HELCOM Pan Baltic Scope EFH WS 2018

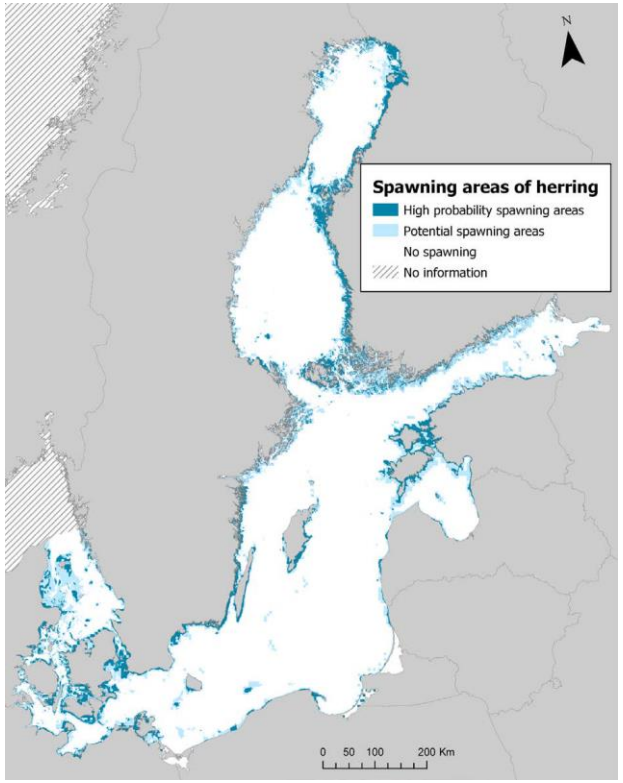
Didzis Ustups, Lena Bergstrom, Henri Jokinen

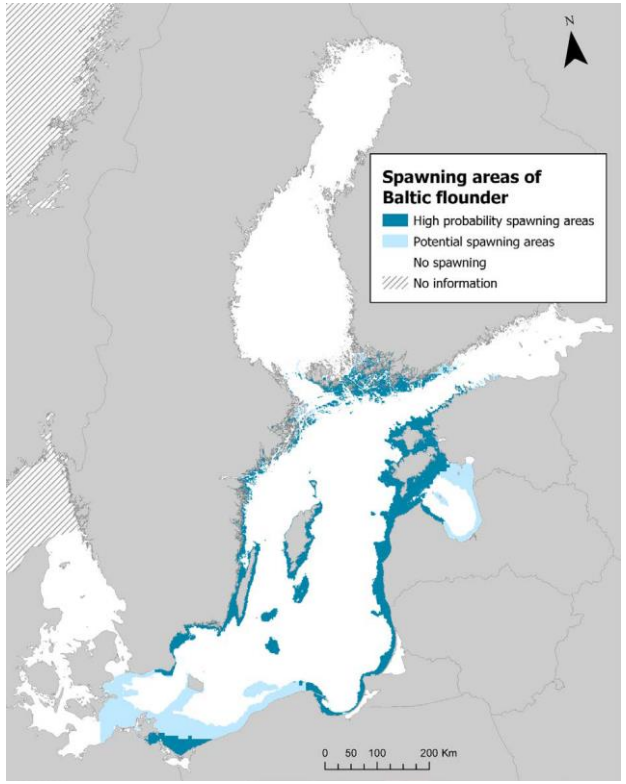


Essential fish habitat maps

- Cod
- Herring
- Baltic flounder







Important areas for spawning or recruitment

- **Map aggregated from data on:**
- Spawning areas of
  - ✓ Cod
  - ✓ herring
  - ✓ sprat
- Spawning and recruitment areas of
  - ✓ European flounder
  - ✓ Baltic flounder
- Recruitment areas of
  - ✓ perch
  - ✓ pikeperch

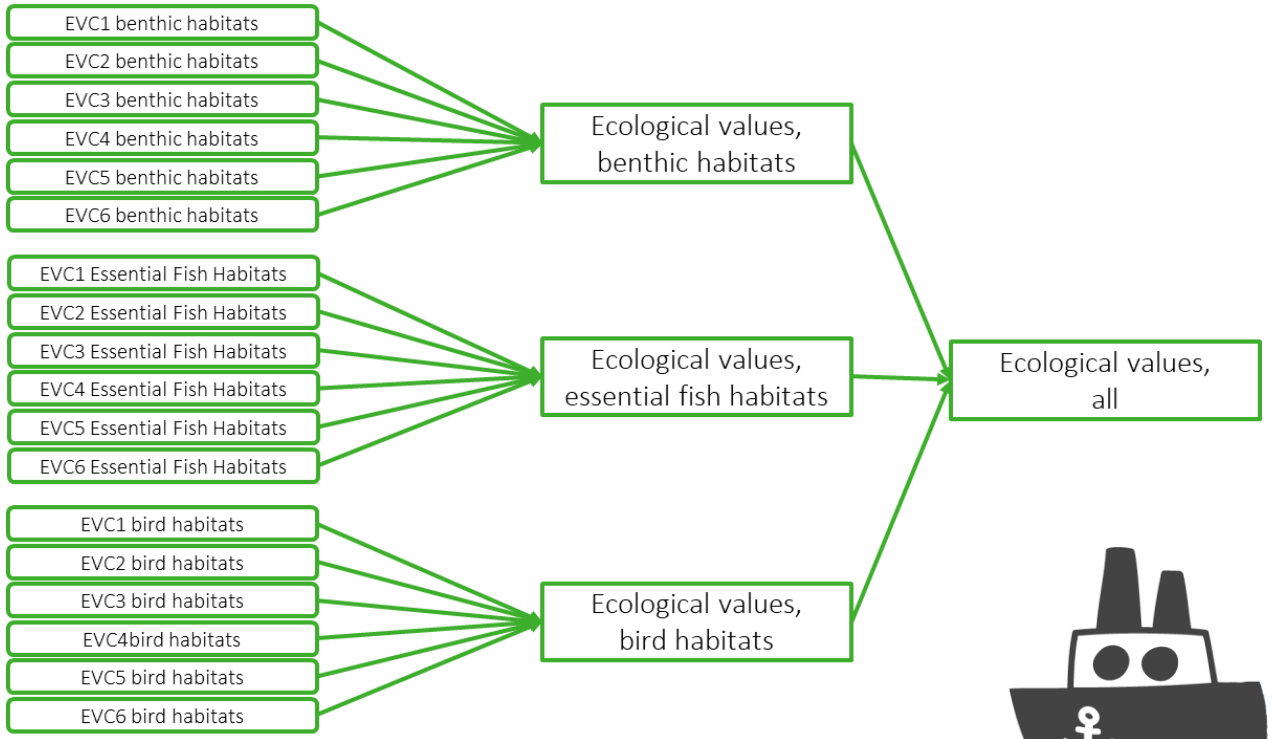
Step 3: Mapping areas of high ecological value

- **Matrix assessment (0 or 1): Ecosystem components in relation to 7 ecological value criteria:**

biological diversity; rarity; importance for threatened, endangered or declining species and/or habitats; vulnerability, fragility, sensitivity, or slow recovery; special importance for life-history stages of species; biological productivity

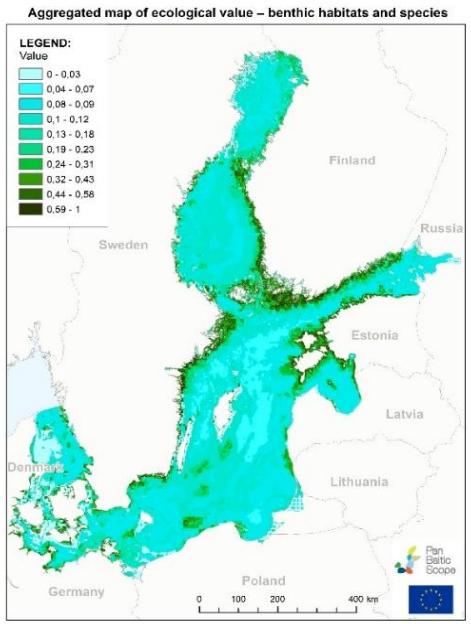
- **Hierarchical data aggregation method in GIS:**

HELCOM BSII Ecological Diversity Components	Biodiversity	Rarity	Importance for threatened, endangered or declining species and/or habitats	Vulnerability, fragility, sensitivity or slow recovery	Special importance for life-history stages of species	Biological productivity
Availability of deep water habitat, based on occurrence of H2S	0	1	0	0	0	0
Infralittoral hard bottom	0	1	0	0	0	0
Infralittoral sand	0	1	0	0	0	0
Infralittoral mud	0	1	0	0	0	0
Infralittoral mixed	0	1	0	0	0	0
Circalittoral hard bottom	1	1	1	1	1	1
Circalittoral sand	0	1	1	1	1	1
Circalittoral mud	0	1	1	1	1	1
Circalittoral mixed	1	1	1	1	1	1
Sandbanks which are slightly covered by sea water at all time (1110)	1	1	1	1	1	1
Estuaries (1130)	1	1	1	0	1	1
Mudflats and sandflats not covered by seawater at low tide (1140)	0	1	0	0	0	0
Coastal lagoons (1150)	1	1	1	0	1	1
Large shallow inlets and bays (1160)	1	1	1	1	1	1
Reefs (1170)	1	1	1	1	1	1
Submarine structures made by leaking gas (1180)	1	1	1	1	1	1
Baltic Esker Islands (UW parts, 1610)	1	1	1	1	1	1
Boreal Baltic islets and small islands (UW parts, 1620)	1	1	1	1	1	1
Furcellaria lumbricalis	1	1	1	1	1	1
Zostera marina	1	1	1	1	1	1
Charophytes	1	1	1	1	1	1
Mytilus sp.	1	1	1	1	1	1
Fucus sp.	1	1	1	1	1	1
Productive surface waters	1	1	1	0	1	1
Cod abundance	0	0	1	0	0	1
Cod spawning area	1	1	1	1	1	1
Herring abundance	0	0	0	0	0	1
Sprat abundance	0	0	0	0	0	1
Recruitment areas of perch	1	1	1	1	1	1
Recruitment areas of pikeperch	0	1	1	1	1	1
Wintering seabirds	1	1	1	1	1	0
Breeding seabird colonies	1	1	1	1	1	0
Grey seal distribution	0	0	0	0	0	0
Harbour seal distribution	0	0	0	0	0	0
Ringed seal distribution	1	1	1	1	0	0
Distribution of harbour porpoise	1	1	1	1	0	0

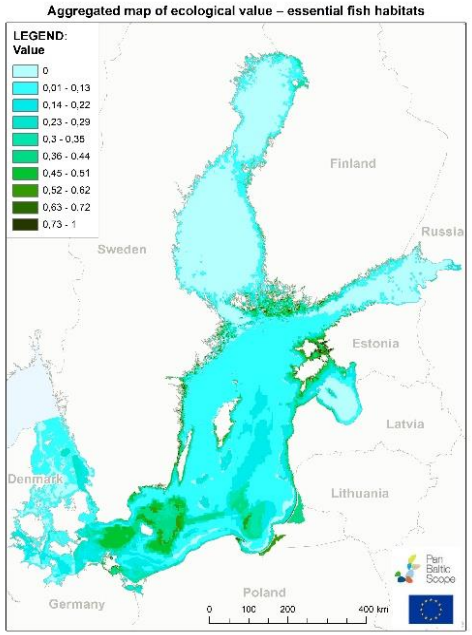


Aggregated EV maps

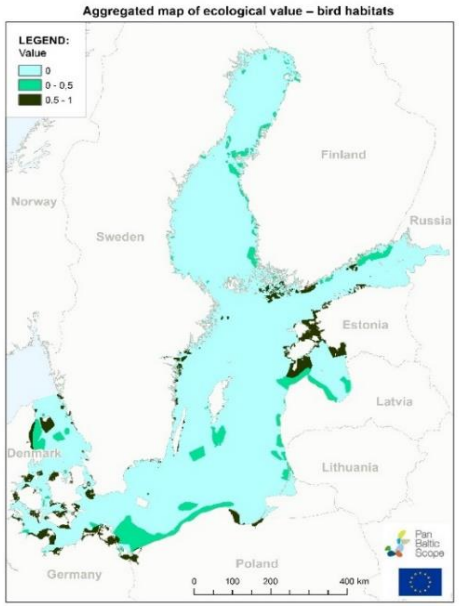
EV - Benthic



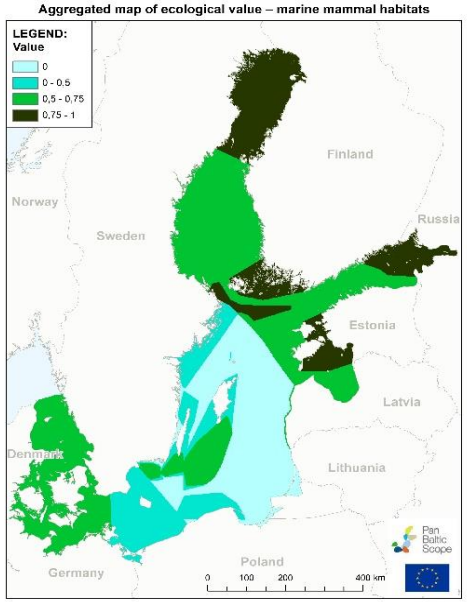
EV - Fish

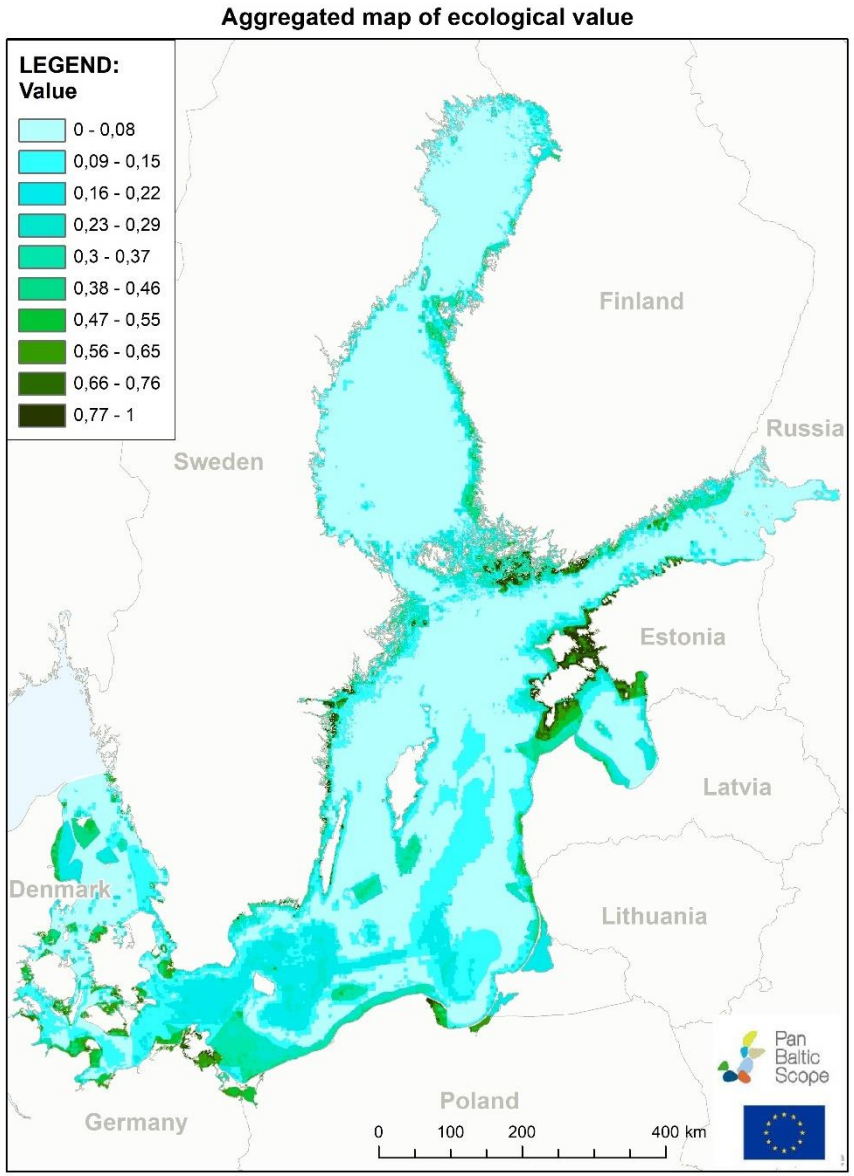


EV - Birds



EV - mammals

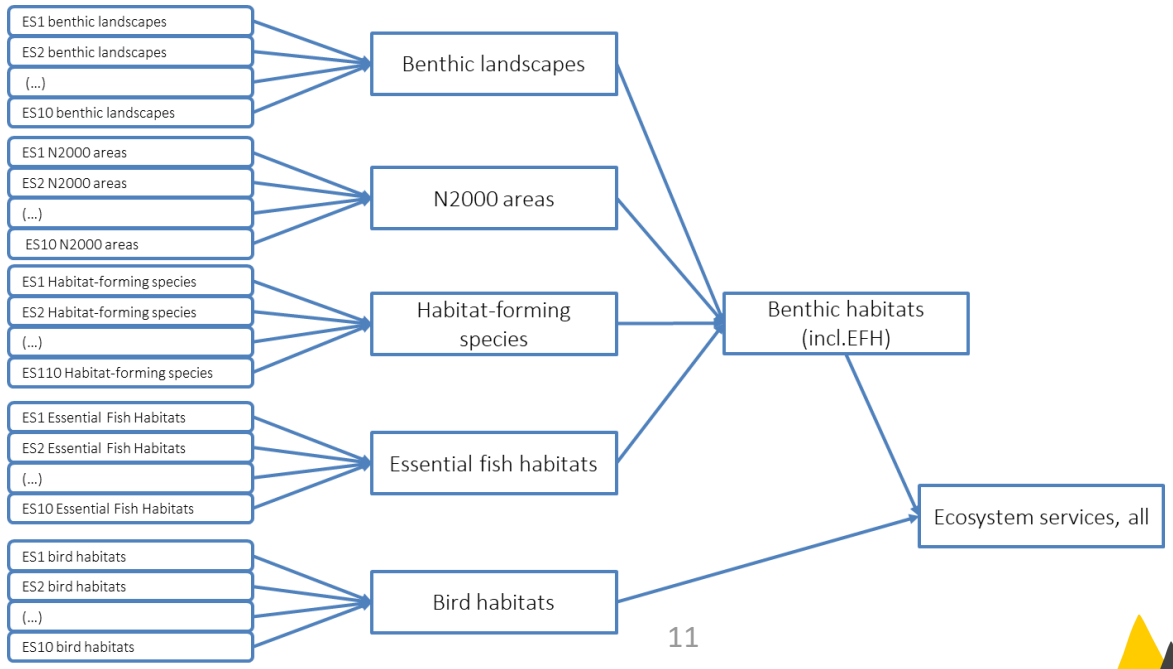




Step 3: Mapping of the areas of ecosystem service (ES) supply potential

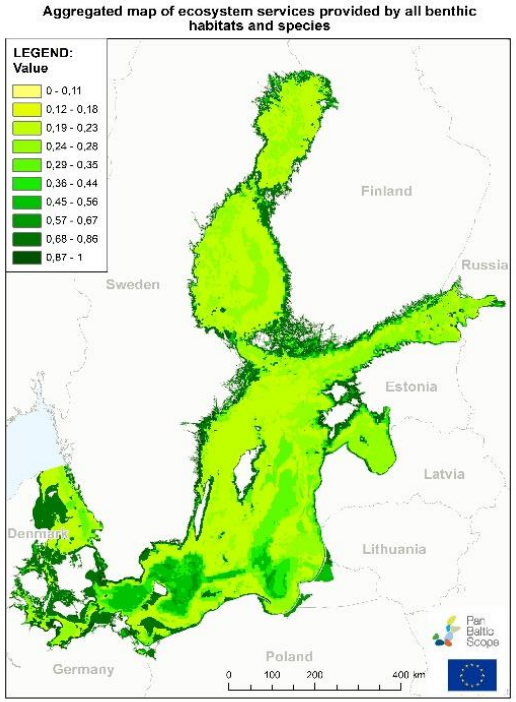
- **Matrix assessment: Ecosystem components in relation to 10 ecosystem services:**
  1) filtration of nutrients; 2) storage of nutrients; 3) storage of hazardous substances;
  4) erosion control; 5) nursery habitats; 6) pest control;
  7) climate control by biological fixation photosynthesis & 8) by sequestration in sediments;
  9) recreation through active a& 10) passive interactions
- **Hierarchical data aggregation method in GIS:**

HELCOM BSII Ecological Diversity Components	Filtration/sequestration/storage/accumulation by micro-organisms, algae, plants, and animals			Control of erosion rates	Maintaining nursery populations and habitats	Pest control (including invasive species)	Regulation of chemical composition of atmosphere and oceans (atmospheric CO^2 and other greenhouse gases):		Characteristics of living systems that that enable activities promoting health, recuperation or enjoyment	
	filtration of nutrients	storage of nutrients	storage of hazardous substances				by biological fixation in process of photosynthesis	by sequestration in sediments	through active or immersive interactions	through passive or observational interactions
Availability of deep water habitat, based on occurrence of H2S	0	1	1	0	0	0	0	1	0	0
Infralittoral hard bottom	1	1	1	1	1	0	1	0	1	1
Infralittoral sand	0	1	1	0	1	0	1	0	1	1
Infralittoral mud	0	1	1	0	1	0	1	1	0	0
Infralittoral mixed	1	1	1	1	1	0	1	0	0	0
Circalittoral hard bottom	1	1	1	0	0	0	0	0	0	0
Circalittoral sand	0	1	1	0	0	0	0	0	0	0
Circalittoral mud	0	1	1	0	0	0	0	1	0	0
Circalittoral mixed	0	1	1	0	0	0	0	0	0	0
Sandbanks which are slightly covered by sea water at all time (1110)	0	1	1	0	1	0	1	0	1	1
Estuaries (1130)	1	1	1	0	1	0	1	1	1	1
Mudflats and sandflats not covered by seawater at low tide (1140)	0	1	1	0	1	0	1	1	1	1
Coastal lagoons (1150)	1	1	1	0	1	0	1	1	1	1
Large shallow inlets and bays (1160)	1	1	1	0	1	0	1	1	1	1
Reefs (1170)	1	1	1	1	1	0	1	0	1	1
Submarine structures made by leaking gas (1180)	0	1	1	0	0	0	0	0	0	0
Baltic Esker Islands (UW parts, 1610)	1	1	1	1	1	0	1	1	1	1
Boreal Baltic islets and small islands (UW parts, 1620)	1	1	1	1	1	0	1	1	1	1
Furcellaria lumbricalis	0	1	1	0	1	0	1	0	1	1
Zostera marina	0	1	1	1	1	0	1	1	1	1
Charophytes	0	1	1	0	1	0	1	1	1	1
Mytilus sp.	1	1	1	0	1	0	0	0	1	1
Fucus sp.	0	1	1	0	1	0	1	0	1	1
Productive surface waters	1	0	0	0	1	0	1	0	1	1
Cod abundance	0	1	1	0	0	1	0	0	1	0
Cod spawning area	0	1	1	0	1	1	0	0	0	0
Herring abundance	0	1	1	0	0	0	0	0	1	0
Sprat abundance	0	1	1	0	0	0	0	0	1	0
Recruitment areas of perch	0	1	1	0	1	1	0	0	0	0
Recruitment areas of pikeperch	0	1	1	0	1	1	0	0	0	0
Wintering seabirds	0	1	1	0	0	1	0	0	1	1
Breeding seabird colonies	0	1	1	0	0	1	0	0	1	1
Grey seal distribution	0	1	0	0	0	0	0	0	1	1
Harbour seal distribution	0	1	0	0	0	0	0	0	1	1
Ringed seal distribution	0	1	0	0	0	0	0	0	1	1
Distribution of harbour porpoise	0	0	0	0	0	0	0	0	1	1

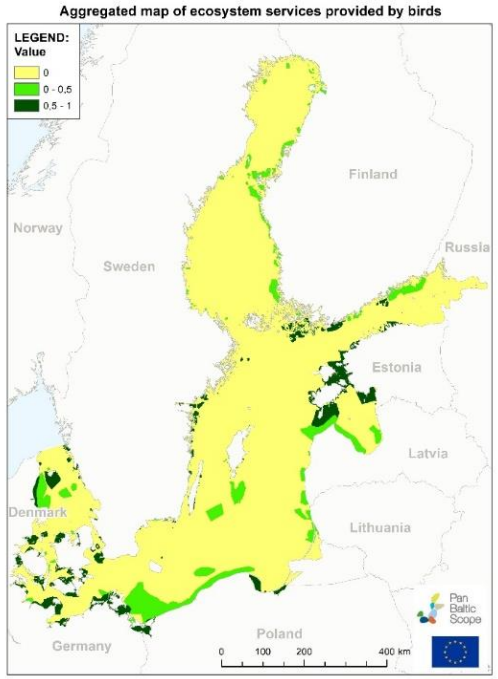


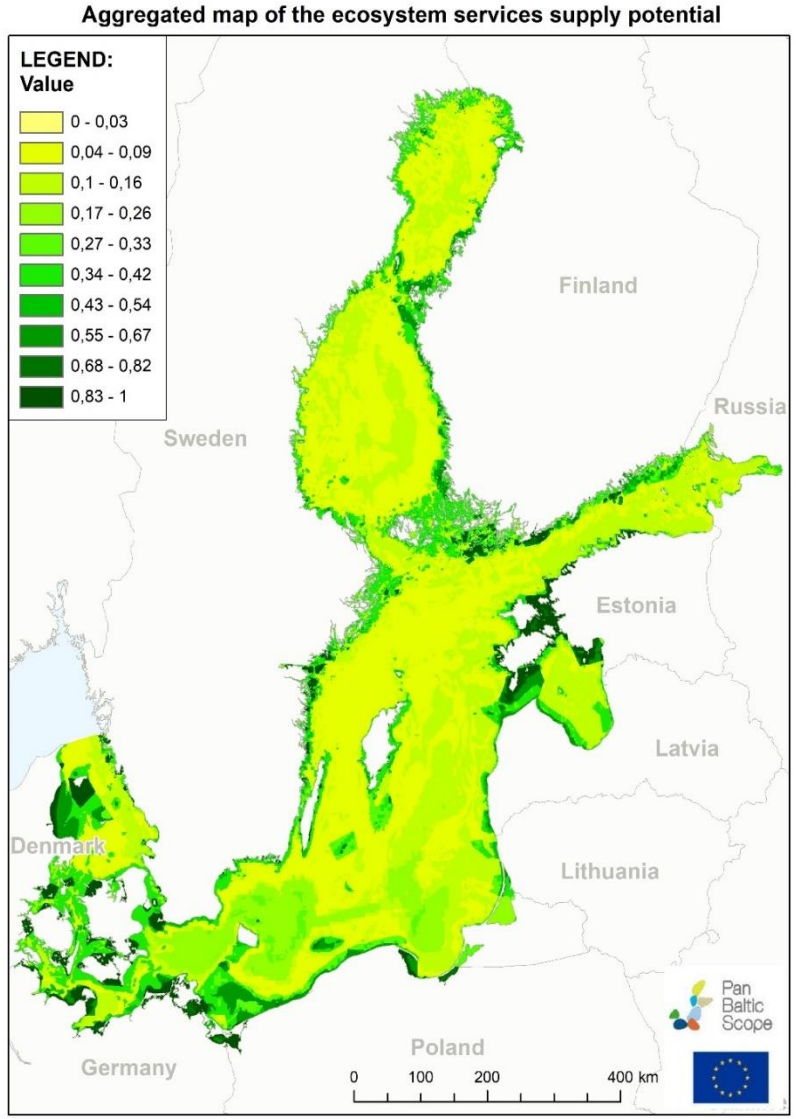
Aggregated ecosystem service maps

ES – Benthic (including ESH)



ES - Birds

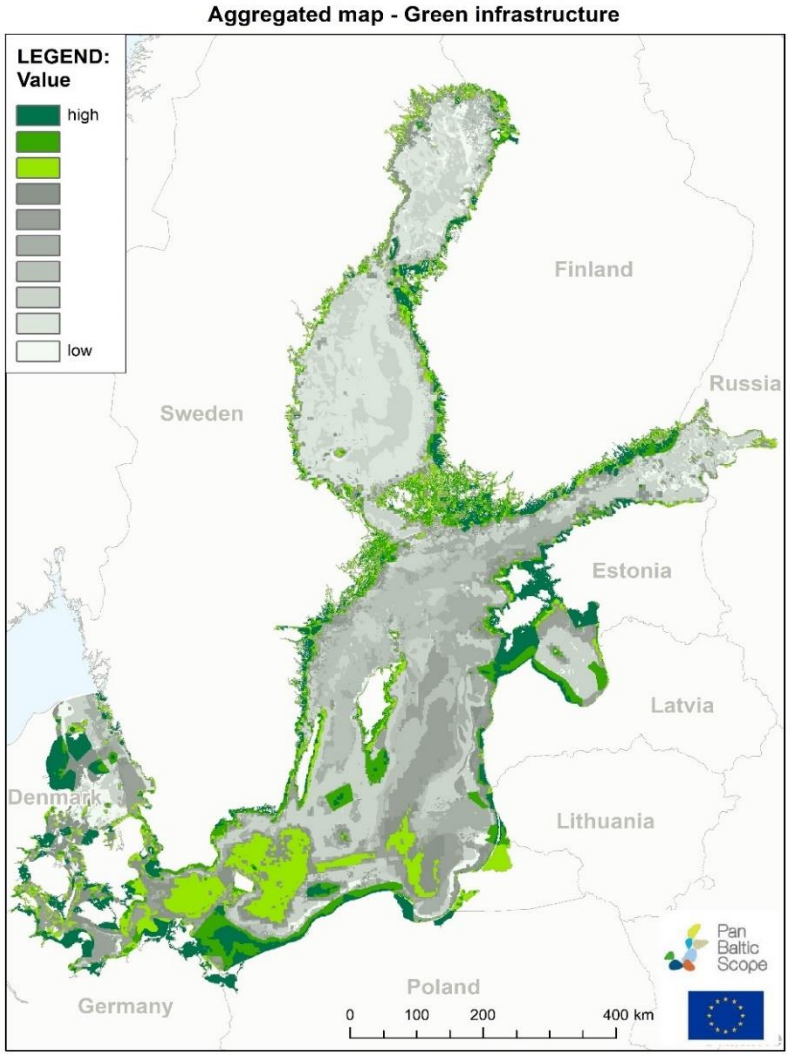




Step 4: Marine GI mapping: combining the tow

Results of testing Pan Baltic Scope approach to marine GI mapping :

- green color indicates the 30 % of the Baltic Sea area which represents the highest ecological and ecosystem service supply value (the most valuable areas in dark green, other highly valuable areas in light green).



Conclusions

- **Marine GI mapping can support implementation of the ecosystem-based approach in MSP** :
  - **To improve the knowledge base on marine ecosystem** structure, functions and service supply and thereby contribute to relational understanding of interrelation between ecological and social and economic systems
  - **To support development of the spatial solutions** by guiding away the potentially harmful development from ecologically valuable/sensitive areas
  - **To support cross-border coordination of the planning solutions in respect to ecological values** (also to improve the connectivity of the MPA network or functionally related parts of the ecosystems)
  - **To be used in SEA process to assess single and cumulative impacts on marine ecosystem**
- **The Pan Baltic Scope methodology shall be further developed:**
  - to improve input data quality
  - to include a connectivity analysis of ecologically valuable areas,
  - to apply more comprehensive approach to ES mapping considering spatial variations in biota, involve the assessment of ecosystem condition, and taking into account ES supply and demand relation.

Maritime Spatial Planning Forum

Global Meets Regional

Thank you!

Reed more about it in the report:
"Green Infrastructure Concept for MSP and Its Application Within Pan Baltic Scope Project"
http://www.panbalticscope.eu/

Co-funded by the European Maritime and Fisheries Fund of the European Union